TECHNICAL INFORMATION ON BUILDING MATERIALS

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FOR USE IN THE DESIGN OF LOW-COST HOUSING

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THE NATIONAL BUREAU OF STANDARDS
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MATERIALS USED IN BITUMINOUS BUILT-UP ROOFING

Most bituminous built-up roofing consists of an impervious membrane of appreciable thickness assembled on the job from layers of bituminous saturated felt which are cemented to each other and to the roof deck with a bituminous cement, usually asphalt or coal-tar pitch, applied hot by mopping.

Built-up roofs may be either surfaced or unsurfaced. The bitumen used in unsurfaced built-up roofs is invariably asphalt, while both asphalt and coal-tar pitch are used for mineral-surfaced roofs. Because of the difficulty of retaining mineral surfacing materials on steep slopes, unsurfaced coverings are used on roofs of steeper pitch. Built-up roofs which are subject to much foot traffic may be finished with promenade tile embedded in a coating of cement mortar laid over the final mopping of bitumen.

Coal-Tar Pitch: Coal-tar pitch is a product of bituminous coal. In the process of manufacturing illuminating gas or coke from such coal, a black viscous liquid known as coal-tar is obtained which, when redistilled to drive off the more volatile constituents, leaves a residue of coal-tar pitch. The quantity of pitch obtained and its characteristics are governed by the type of tar used and the method of production. In general, however, it may be stated that coal-tar pitch, because of its high resistance to the disintegrating action of water, makes an excellent roofing and waterproofing agent. It is particularly adaptable for use in the construction of the so-called "dead-level" bituminous built-up roofs on which water may collect and stand. (See Federal Specification R-P-381,[1] "Pitch; Coal-Tar (for) Mineral-Surfaced Built-Up Roofing, Waterproofing and Dampproofing", Type I, Coal-tar pitch for built-up roofing.)

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[1] Federal Specifications listed in this paper may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., (Price 5 cents each).

Asphalt: Asphalts for roofing purposes may be either fluxed native asphalts (Trinidad or Bermudez or Lake asphalts), or those derived from petroleum (artificial or petroleum asphalts). Most of the asphalt used for roofing purposes in this country is obtained as a by-product in the manufacture of gasoline, fuel oil, lubricating oil, etc., from crude petroleum. Like coal-tar pitch, these are also distillation residues, variously treated, their characteristics depending on the nature of the original oil and the process by which they are produced. Asphalt is also an excellent roofing and waterproofing material, probably less resistant to moisture and sunlight than coal-tar pitch, but also less susceptible to temperature changes and, therefore, better suited than coal-tar pitch for the construction of built-up roofing on steeper slopes. (See Federal Specification SS-A-666,[1] "Asphalt; (for) Built-Up Roofing, Waterproofing and Dampproofing", Type I, Asphalt for surfaced built-up roofing, Type II, Asphalt for unsurfaced built-up roofing.)

Felt: Felts used in the construction of bituminous built-up roofing may be roughly classified as rag or asbestos felts. The rag felts are made on a paper making machine from various fiber stocks, the most common source of which is cotton rags. In recent years, however, it has been the general practice to substitute such materials as jute and manila bagging, old newspapers, and sawdust for a part of the rag stock.

The raw felt is impregnated by running the sheets through a tank containing asphalt or coal-tar pitch maintained at a high temperature. Unsaturated rag felt for the construction of built-up roofing should weigh not less than 5.2 pounds per 100 square feet and saturated rag felt between 13 and 15 pounds per 100 square feet. For flashings, the raw felt should weigh not less than 10.4 pounds per 100 square feet and the saturated felt between 27½ and 30½ pounds. (See Federal Specification HH-F-191, "Felt; Asphalt-Saturated (for) Flashings, Roofing and Waterproofing", Type I, Asphalt-saturated felt for mineral-surfaced built-up roofing and for membrane waterproofing, and Type II, Asphalt-saturated felt for flashings; also Federal Specification HH-F-201, "Felt; Coal-Tar Saturated (for) Roofing and Waterproofing.")

Asbestos felts are usually made from asbestos fiber mixed with various sizing materials; and, at times, cotton rag stock, wood pulp, hair, or other material is added. They have less strength than the rag felts and do not absorb as much saturant. (Federal Specifications for bituminous saturated asbestos felts have not been issued.)

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Surfacing Materials for Bituminous Built-Up Roofing: Surfacing materials are used to permit the application of heavy surface coatings of bitumen which, otherwise, if exposed directly to the sun's rays, would tend to flow and disintegrate more rapidly.

Slag and Gravel: Crushed blast-furnace slag or water-worn gravel, dry and free from sand, clay and other foreign substances, and from one-quarter to five-eighths inch in size, are the most commonly used surfacing materials.

Promenade Tile: Vitrified shale tile, slate and alberene stone are used as promenade tile. They are usually embedded in a coating of portland cement mortar of not less than three-quarters of an inch in thickness, laid over a five-ply bituminous built-up roof. Joints between the tile should be grouted with portland cement mortar. Expansion joints extending through the tile and cement mortar are necessary between the tile and all flashings, and throughout the roof surface, in no case spaced more than twenty feet apart.

Prepared Roofing: Mineral-surfaced asphalt prepared roofing is sometimes used as a cap sheet for comparatively steep built-up roofs. This cap sheet usually consists of a single thickness of roofing felt impregnated with an asphaltic saturant, coated on one side, approximately one-half of the width, with an asphaltic coating in which are embedded mineral granules.

For a condensed summary of the Federal Specifications covering materials used in the construction of bituminous built-up roofs; also for methods of laying various types of such roofs (not covered by Federal specifications), reference may be made to Navy Department Specification No. 7Yg, "Roofing, Siding and Sheet Metal Work; Dampproofing and Membrane Waterproofing", obtainable free, upon request, from the Bureau of Yards and Docks, Navy Department, Washington, D. C.